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Article

Digital Divides and Productive Development in Rural Women: A Systematic Analysis

Brechas Digitales y Desarrollo Productivo en Mujeres Rurales: Un Análisis Sistemático

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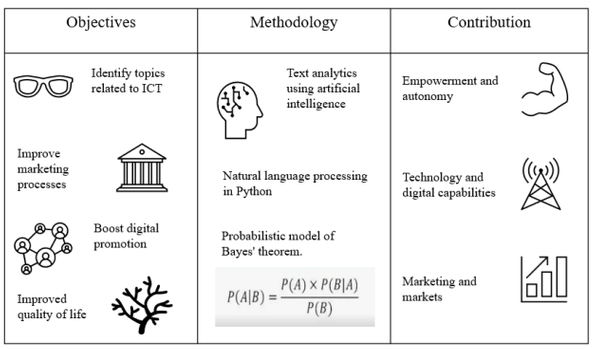
Abstract

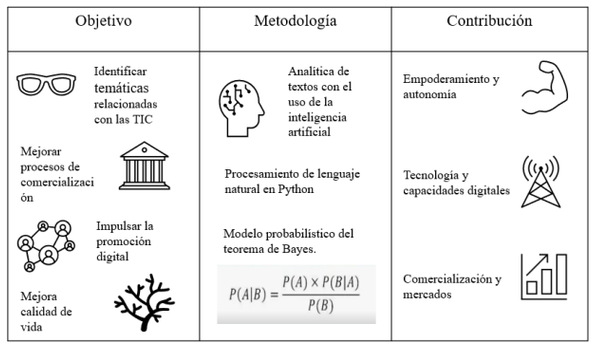
A systematic review based on the PRISMA methodology was conducted to identify themes related to the use of Information and Communication Technologies (ICTs) to empower rural women by improving their cooperative marketing processes and digital promotion, thereby enhancing their quality of life. The analysis included 29 scientific documents, processed through AI-powered text analysis using natural language processing techniques in Python and the Bayesian probabilistic model. The results identified three key topics: 1) The digital literacy gap and its effects on access to entrepreneurship and health; 2) Community empowerment and access to digital resources to improve living conditions in rural areas; and 3) The impact of access to mobile technology on the economic and social development of rural women entrepreneurs. This leads to the conclusion that tools such as smartphones, mobile internet, digital commerce platforms, social media, email, and messaging systems, coupled with technological training and strategic digital adoption plans, are fundamental to expanding the productive opportunities of rural women, strengthening the collective economy, and improving their quality of life.



Rural, Women, Digital technologies

Resumen

Revisión sistemática basada en la metodología PRISMA, con el objetivo de identificar temáticas relacionadas con el uso de las Tecnologías de la Información y la Comunicación (TIC) con el fin de empoderar a mujeres rurales mediante la mejora de sus procesos de comercialización cooperativa y promoción digital mejorando. Se incluyeron 29 documentos científicos, procesados a través de analítica de textos con IA, empleando técnicas de procesamiento de lenguaje natural en Python y el modelo probabilístico del teorema de Bayes. Como se resultado se identifican tres tópicos: 1] Brecha de alfabetización digital y sus efectos en el acceso al emprendimiento y la salud, 2] Empoderamiento comunitario y acceso a recursos digitales para mejorar las condiciones de vida en zonas rurales, 3] Impacto del acceso a tecnología móvil en el desarrollo económico y social de las emprendedoras rurales. Se concluyó que las herramientas como los teléfonos inteligentes, el internet móvil, las plataformas de comercio digital, las redes sociales, y los sistemas de mensajería, acompañadas de capacitación tecnológica y planes estratégicos de adopción digital, son fundamentales para ampliar las oportunidades productivas de las mujeres rurales, fortalecer la economía colectiva y mejorar su calidad de vida.



Rural, Mujeres, Tecnologías digitales

Area: Development of strategic leading-edge technologies and open innovation for social transformation

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Introduction

According to the United Nations, micro, small and medium-sized enterprises (MSMEs) account for approximately 90% of all businesses worldwide, generating up to 70% of jobs and contributing up to 50% of global gross domestic product (UN, 2024, p. 2). According to the Organisation for Economic Co-operation and Development, the Development Bank of Latin America and the Caribbean, and the Latin American and Caribbean Economic System, SMEs represent around 99% of all businesses and generate up to 70% of formal employment, making them fundamental organisations for economic development, innovation, and job creation (OECD et al., 2024).

In Latin America, SMEs account for approximately 99.5% of businesses and contribute around 60% of formal employment (OECD et al., 2024), and in Mexico they constitute the majority of the business economy. They represent around 99.8% of the country's economic units and generate around 70% of jobs (INEGI, 2024).

ICTs, such as the internet and smartphones, represent a transformative opportunity for rural communities. They empower women by allowing them to participate more in decision-making and giving them access to new markets. This contributes to economic development and the reduction of gender inequalities. The adoption of e-commerce and digital services allows women to access broader markets, which is reflected in their income (Ma et al., 2023).

The literature suggests that the use of ICTs, e-commerce, social media, digital marketing, and collaborative tools can significantly improve the economic autonomy of rural women, provided that digital literacy, technological infrastructure, and training support are in place. However, the evidence is still fragmentary.

Therefore, this research conducts a systematic review using PRISMA to integrate findings on digital technologies that strengthen the productive and commercial capacities of rural women, particularly those involved in artisanal models. To this end, the following research questions are formulated:

How do ICTs contribute to the economic empowerment of rural women? What barriers limit their access to digital environments? Which digital tools have the greatest potential for productive development? These questions will be answered in the results section.

Methodology

This research involved a systematic review using the PRISMA methodology, with the aim of identifying the current status of ICTs in women-led artisan SMEs and identifying problems related to the use and implementation of ICTs that support these SMEs in achieving economic growth and improving their digital marketing processes, as well as increasing their sales. The introduction justifies the systematic review and outlines the research questions.

Document database

To compile the database of evaluated scientific articles, inclusion and exclusion criteria were applied to discard those that did not meet the objectives of this systematic review and to eliminate some that, although they contained adequate information, did not meet those objectives.

Searches were conducted in the Web of Science, Scopus, and Google Scholar databases, using the terms ‘rural,’ ‘women,’ and ‘digital technologies’ appearing simultaneously [‘women’ AND ‘rural’ AND ‘(digital technologies)’]. The Boolean operators “OR” and ‘NOT’ were not used.

Inclusion criteria

The inclusion criteria considered were that only scientific articles published between 2015 and 2024, indexed in Web of Science, Scopus or Google Scholar, addressing the use of ICTs by rural women, rural entrepreneurship, artisanal production, digital literacy or community empowerment, and available in English or Spanish, would be selected. Exclusion criteria ruled out non-academic documents, studies that did not address gender or the rural context, and articles that lacked methodological clarity. For the analysis, text analytics techniques were used with Python and a latent Bayesian classifier was applied, which identified three dominant topic.

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Box 1

Figure 1

Age groups that do not use computers

Databases	Period	Documents found
Web of Science	2015–2024	312
Scopus	2015–2024	204
Academic Google	2015–2024	444

Source: Own Elaboration

Box 2

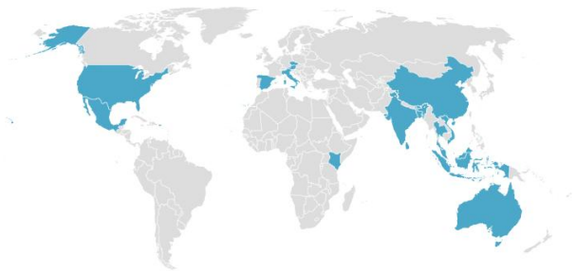

Figure 2

Geographical area

Source: Own Elaboration

Box 3

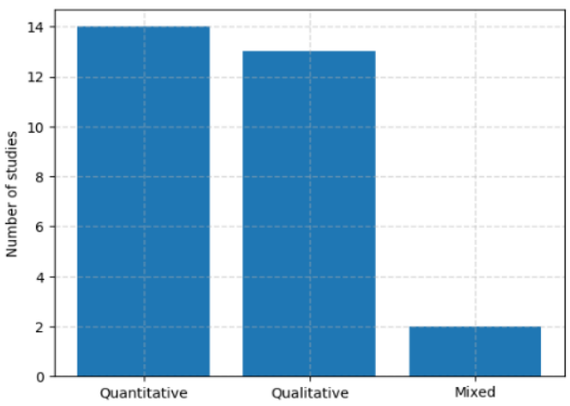

Figure 3

Inclusion criteria

Source: Own Elaboration

Box 4

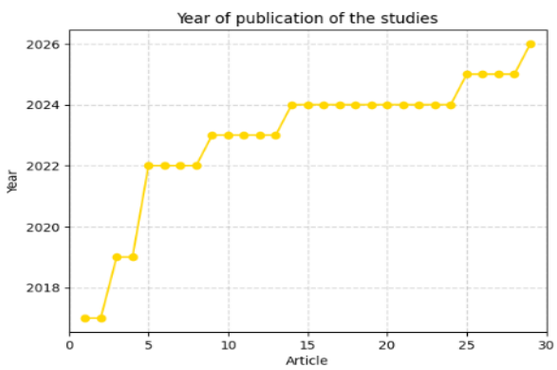

Figure 4

Year of publication

Source: Own Elaboration

After applying the inclusion criteria, 29 articles were selected. Bayesian topic modelling produced three central themes relevant to the digital development of rural women.Topic 1: The digital literacy gap and its effects on access to entrepreneurship and health. Digitalisation is transforming sectors around the world, opening up new opportunities for innovation, efficiency and development.

Women-led businesses use digital technology to drive growth

Inclusive economic growth, promote gender equality and contribute to a sustainable future. To achieve maximum impact and an environment conducive to success, it is essential to provide women entrepreneurs with access to digital tools and resources. Digital technology helps women entrepreneurs optimise operations, increase production and reduce expenses. E-commerce platforms, digital marketing, and cloud computing enable businesses to operate more efficiently, access new markets, and grow faster (Thomas, 2025). Considering new ideas and taking advantage of technological advances are essential variables in helping women entrepreneurs achieve long-term success.

Campaigns that promote digital literacy and the use of technical applications have helped women overcome deeply rooted barriers, access innovative markets, automate business operations, and increase labour productivity (Thomas, 2025). A study conducted in Extremadura, Spain, analysed 400 women over the age of 15, evaluating the role of digital technologies in female entrepreneurship.

The results showed that, despite having access to these technologies, most did not use them for work or business purposes, but mainly for social or entertainment activities. In addition, limited family support for the use of ICTs for productive purposes was identified. Strengthening support networks and providing adequate training to rural women is an effective way to enhance the empowerment opportunities offered by ICTs (Sánchez & Sánchez, 2017).

Consequently, access to ICTs alone does not guarantee equity, but must be accompanied by digital training, adequate technological infrastructure and gender-sensitive public policies.

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Factors such as technical training, institutional support and the building of collaborative networks are essential for rural women artisans to fully reap the benefits of digitalisation. Theme 2: Community empowerment and access to digital resources to improve living conditions in rural areas.In recent years, there has been a considerable increase in research on digitalisation and its impact on rural women, indicating that this is a field of great academic and social interest. However, this increase in publications does not necessarily translate into practical solutions or effective policies that directly benefit these women (Ramasamy et al., 2025).

Collaborative marketing schemes are conceived as an innovative model that allows small producers to share digital resources, optimise distribution channels and increase the visibility of products in virtual environments, thus promoting collective competitiveness and economic sustainability.On the other hand, rural development programmes often lack mechanisms that recognise and redistribute unpaid care work, limiting the transformative potential of gender-focused interventions. Integrating the care economy through time use analysis, adequate infrastructure, and policies that promote gender co-responsibility is essential to ensure real inclusion (Benería et al., 2015; Cruz-Carrasco et al., 2025).

The success of women's empowerment initiatives through the use of ICTs depends on a complex interaction of individual factors such as entrepreneurial skills, resilience and psychological capital, social factors such as family support and professional networks, structural factors such as access to finance and markets, and innovation such as the adoption of digital technologies (Ramos Farroñán et al., 2024).

Theme 3: Impact of access to mobile technology on the economic and social development of rural women entrepreneurs.The use of electronic devices such as smartphones facilitates access to information and provides important communication opportunities, reducing the vulnerability of rural women and, consequently, improving their livelihoods, facilitating better access to local services and markets, and promoting their autonomy (Biswas et al., 2022).

In developing countries, women are 10% less likely than men to use mobile internet, and 26% of these women do not use mobile internet, meaning less access to digital services such as payment and logistics services. This gap limits their participation in digital commerce, affects their economic empowerment, and restricts their use of essential services such as electronic payments and logistics platforms. On the other hand, data shows the positive impact of adopting digital tools in businesses run by women entrepreneurs, provided that there is active and positive training in these tools, infrastructure, and regulatory conditions.

In summary, this article, using data from Alibaba and official data from the United States, Bhutan, and Kenya, demonstrates that the adoption of digital tools and the introduction of women into the digital market represent an economic benefit for women's businesses and enterprises, reducing their exposure to violence and discrimination and reducing the amount of unpaid work time spent on household care tasks (Sicat et al., 2020).Other studies show that women-led SMEs are more likely to use social media for promotion and sales (Alam et al., 2022), reflecting a favourable attitude towards the adoption of digital technologies.

Similarly, international reports have documented that women represent the majority of the unconnected population and that a significant percentage face difficulties in accessing mobile internet due to cost, lack of digital skills and security concerns (Women, 2019).Finally, research conducted in Malaysia indicates that, although most artisans have smartphones and access to Wi-Fi, internet use is often limited. The main barriers to adopting digital tools include costs, limited training, lack of institutional support, and negative perceptions of technology. Recommendations include improving infrastructure, offering digital skills training, and modernising e-commerce platforms (KAMARUDIN et al., 2024).

Discussion of results.To answer the question, ‘How do information and communication technologies contribute to the economic empowerment of rural women?’, the results obtained in this systematic review allow us to affirm that these technologies are a determining factor in strengthening the productive capacities of women in rural contexts.

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Digitisation enables the optimisation of processes, the expansion of market access, and the reduction of costs associated with commercial activities. Several studies indicate that e-commerce platforms, digital marketing, and cloud computing promote more inclusive economic development and enable women entrepreneurs to increase their competitiveness and economic autonomy (Thomas, 2025). Likewise, it has been observed that digital literacy and the strategic use of technological tools facilitate the overcoming of historical barriers linked to access to the labour and productive markets, strengthening their economic and social participation (Kofler & Walder, 2024; Sánchez & Sánchez, 2017).

In relation to the question, 'What barriers limit your access to digital environments?', the review shows that there are structural, technological and sociocultural barriers that restrict rural women's full appropriation of technologies (Othman et al., 2022). The lack of adequate infrastructure, low levels of digital literacy and so-called 'digital poverty' continue to be factors that prevent the full exploitation of technological benefits (Ma et al., 2023).

Added to this are social obstacles, such as limited family and community support for the use of digital tools for productive purposes (Sánchez & Sánchez, 2017). Gender gaps in access to mobile internet also persist; for example, in developing countries, women are 10% less likely to use these services, which affects their access to logistics platforms, electronic payment services, and marketing opportunities (Women, 2019). Taken together, these limitations deepen existing inequalities and restrict women's digital empowerment.

Finally, in response to the question, 'Which digital tools have the greatest potential for the productive development of rural women?', the findings indicate that smartphones, mobile internet and digital commerce platforms are the most relevant and impactful tools (Benavente et al., 2021; Dykha et al., 2021; Palacios, 2003). The use of smartphones facilitates access to information, services, markets and communication networks, helping to reduce socio-economic vulnerability and strengthening personal and community autonomy (Biswas et al., 2022).

E-commerce is identified as a mechanism that increases income and expands the commercial presence of women artisans and entrepreneurs (Ma et al., 2023; Nicola & Setiawan, 2024). Similarly, the use of social media to promote products and services is an effective strategy for improving the visibility and competitiveness of women's enterprises (Alam et al., 2022). Additionally, there is evidence that the introduction of digital tools reduces the time spent on unpaid tasks and facilitates entry into emerging digital markets (Sicat et al., 2020).

Conclusions

After conducting the systematic review and taking into account the classification of the articles analysed, it is concluded that digital transformation is an essential pillar for the productive and social development of rural women. ICTs as a whole consolidate a group of strategic instruments that expand economic capacities and strengthen autonomy by facilitating access to broader, even global, markets. Digital literacy and the availability of technological infrastructure are key factors for the successful integration of e-commerce and mobile internet.

Likewise, the findings confirm that the digital literacy gap persists as a constraint, conditioning the adoption of technologies for commercial purposes and restricting access to information and market opportunities. Overcoming these barriers requires continuous training and capacity-building programmes, as well as public policies to support them. Considering the existing conditions in different rural areas, as they do not have the same levels of infrastructure.

On the other hand, social support is identified as a key element in the effective adoption of ICTs. Collaborative marketing schemes and support networks make it possible to reduce costs, share resources and improve commercial presence, although this impact varies depending on the level of community cohesion achieved.

On the other hand, community empowerment emerges as a key element for the effective adoption of ICTs.

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Collaborative marketing schemes, support networks and social capital make it possible to reduce costs, share digital resources and improve the commercial presence of women in digital environments, although their impact varies depending on the degree of community cohesion.

Finally, it is confirmed that access to technology and mobile internet is a decisive factor in the economic and social development of rural women entrepreneurs. These technologies enable immediate communication, agile business management, and access to financial services and broader markets. However, the magnitude of these benefits depends on the existence of minimal infrastructure and a minimum degree of digital literacy. Taken together, this evidence suggests that the adoption of ICTs must be supported by conscious and context-appropriate technical training, adequate minimum infrastructure, and the strengthening of support networks to generate sustainable and equitable impacts on the lives of rural women

Declarations

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Contribution of the authors

Ramos-Marquez, José Eduardo: Contributed to the introduction, scientific literature search, data management and validation, review and editing of the final work, preparation of results, interpretation of results and conclusions.

Jiménez-García, Martha: Contributed to the scientific literature search, methodology, and descriptive analysis results.

Availability of data and materials

The data are publicly available in the Scopus, Web of Science, and Google Scholar bibliographic databases.

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National Polytechnic Institute.

Abbreviations

ICT: Information and Communication Technologies
SME: Small and Medium-sized Enterprises.

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